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The Juglandaceae of Iowa

Juglandaceae Lindl. Nat. Syst. Ed. 2, 180, 1836

WALNUT FAMILY

Betulaceae of Iowa

Betulaceae Agardh, Aphor. 208, 1825

THE BIRCH FAMILY

The Fagaceae of Iowa

Fagaceae Drude, Phan., 409, 1879

OAK OR BEACH FAMILY

Thomas Jefferson
BY T. J. AND M. F. L. FITZPATRICK.

FROM THE
PROCEEDINGS OF THE IOWA ACADEMY OF SCIENCES.
VOLUME VIII.

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Herbarium

THE JUGLANDACEAE OF IOWA.

BY T. J. AND M. F. L. FITZPATRICK

Juglandaceae Lindl. Nat. Syst. Ed. 2, 180, 1836

WALNUT FAMILY.

The walnut family comprises six genera and about 35 species. Only two genera occur in Iowa, namely, *Juglans* (Walnut) and *Hicoria* (Hickory), and these two genera are represented by two and five species respectively. From an economic point of view the species are valuable and consequently have been largely utilized until but few specimens of the older forest remain. The younger growth is hardy and will, if spared, eventually yield fair returns.

In general terms the walnut family includes trees with alternate pinnate exstipulate (sometimes stipulate in the bud) leaves and monoecious bracteolate flowers. The staminate flowers are in long-drooping aments with an irregular calyx adnate to the bract and three to many stamens. Pistillate flowers are solitary or clustered with a regular 3-5-lobed calyx adherent to the partially 2-4-celled 1-ovuled ovary; styles 2; fruit a drupe with a fibrous or woody husk and a large 2-4-lobed seed.

JUGLANS. Husk indehiscent; nut furrowed.

HICORIA. Husk 4-valved, dehiscent; nut smooth or angled.

Juglans nigra L. Sp. Pl. 997. 1753. Black Walnut. A tree, 50-100 feet or more high, with furrowed strong-scented brown bark, wood purplish brown, pith in transverse plates, young twigs and petioles puberulent, becoming glabrous with age, and odd-pinnate leaves. Leaflets nearly sessile, serrate, 11-23, ovate-lanceolate, acuminate, mostly glabrous above, pubescent beneath, base sub-cordate or unequal; fruit spherical, 4-celled at the base.

This species occurs in rich woods, flowering in April and May and the fruit ripening in October or November. It is common throughout the state. The wood is heavy, hard, strong, coarse-grained, liable to check in seasoning, and takes a beautiful polish. The wood has been much used in cabinet making, interior finish, for gun stocks, picture frames, etc. For many years walnut logs were a common shipment until the supply was practically exhausted. Oak has now taken the place of the walnut in cabinet making. The corrugated nut is frequently gathered and kept for sale. A decoction of the bark is a frequent domestic dye.

Our specimens are from Johnson, Jefferson, Decatur, and Pottawattamie counties. We have observed the species in Winneshiek, Allamakee, Clayton, Dubuque, Jackson, Scott, Lee, Van Buren, Appanoose, Ringgold, Union, Page, Taylor, Fremont, and Montgomery counties. The State University herbarium has specimens from Story, Calhoun, and Delaware counties. Prof. Pammel reports the species from Woodbury, Hamilton, Boone, and Hardin counties; Mr. Reppert, from Muscatine county; Prof. Bessey, from Fayette and Des Moines counties; Prof. Macbride, from Dubuque, Humboldt, and Dickinson counties; Mr. Gow, from Adair county; Mr. J. P. Anderson, by note, from Lucas county; and Mr. Mills, by letter, from Henry county. In general the black walnut is common throughout the state and represented mostly by the second growth trees.

Parry, in Owen's Geol. Sur. Wisconsin, Iowa, and Minnesota, p. 618; White, Geol. Sur. of Iowa, Vol. 1, p. 138. Bessey, Contr. to the Flora of Iowa in Fourth Report Iowa Agr. Col., p. 118; Arthur, Contr. to the Flora of Iowa, p. 29; Nagel and Haupt, Proc. Davenport Acad. of Natural Sciences, Vol. 1, p. 163; Hitchcock, Trans. St. Louis Acad. of Science, Vol. 5, p. 157; Pammel, Proc. Iowa Acad. of Sciences, Vol. 3, p. 132; Iowa Geol. Sur., Vol. 10, p. 312; Fink, Proc. Iowa Acad. of Sciences, Vol. 4, p. 101; Fitzpatrick, Proc. Iowa Acad. of Sciences, Vol. 5, p. 127 and p. 163; Vol. 6, p. 196; Iowa Geol. Sur., Vol. 8, p. 313; Cameron, Iowa Geol. Sur., Vol. 8, p. 198; Macbride, Iowa Geol. Sur., Vol. 4, p. 119; Vol. 7, p. 107; Vol. 10, p. 237 and p.

645; Gow, Proc. Iowa Acad. of Sciences, Vol. 6, p. 62; Rigg, Notes on the Flora of Calhoun County, p. 25; Barnes, Reppert, and Miller, Proc. Davenport Acad. of Natural Sciences, Vol. 8, p. 255; Reppert, Iowa Geol. Sur., Vol. 9, p. 386; Arthur, Flora of Floyd county in History of Floyd County, p. 300; Bot. Gaz., Vol. 7, p. 127.

Juglans cinerea L. Sp. Pl. Ed. 2, 1415, 1763. Butternut. White Walnut. A tree, smaller than the black walnut, bark gray, twigs and petioles viscid-pubescent; leaflets 11-19, oblong-lanceolate, acuminate, base obtuse, rounded or truncate; fruit oblong, pointed, clammy, 2-celled at the base.

The wood of this species has many characters in common with the black walnut and is used in cabinet work, interior finish, etc. The wood differs from the black walnut in being light, soft, of less strength, and of a light brown color. Trees rarely exceed 80 or 90 feet in height and are usually less than two feet in diameter.

Our specimens are from Fayette and Johnson counties. We have observed the species in Jefferson, Allamakee, Winneshiek, Clayton, and Dubuque counties. The state university herbarium contains specimens from Lee, Winnebago, Des Moines, Cerro Gordo, Delaware, Pottawattamie, and Fremont counties. Mr. Reppert reports the species from Muscatine county; Messrs. Nagel and Haupt from Scott county; Professor Bessey from Story county; Professor Macbride from Humboldt county; Mr. Gow from Madison county; and Professor Pammel from Boone and Hardin counties. In general the butternut is frequent all along the eastern border of Iowa and passes through the central portion west to the Missouri river. It appears to be absent in our strictly southern counties. A decoction of the bark is frequently employed in domestic dyeing.

White, Geol. Sur. of Iowa, Vol. 1, p. 138; Bessey, Contr. to the Flora of Iowa in Fourth Report of Iowa Agr. Col., p. 118; Arthur, Contr. to the Flora of Iowa, p. 29; Nagel and Haupt, Proc. Davenport Acad. of Nat. Sciences, Vol. 1, p. 163; Hitchcock, Trans. St. Louis Acad. of Science, Vol. 5, p. 517; Pammel, Iowa Geol. Sur., Vol. 9, p. 243; Vol. 10,

p. 312; Fink, Proc. Iowa Acad. of Sciences, Vol. 4, p. 101; Fitzpatrick, Proc. Iowa Acad. of Sciences, Vol. 5, p. 127 and p. 163; Cameron, Iowa Geol. Sur., Vol. 8, p. 198; Macbride, Iowa Geol. Sur., Vol. 4, p. 119; Vol. 7, p. 107; Vol. 10, p. 645; Sargent, Forest Trees of N. A., p. 130; Barnes, Reppert, and Miller, Proc. Davenport Acad. of Nat. Sciences, Vol. 8, p. 255; Reppert, Iowa Geol. Sur., Vol. 9, p. 386; Arthur, Flora of Floyd county in History of Floyd county, p. 300; Bot. Gazette, Vol. 7, p. 127; Gow, Proc. Iowa Acad. of Sciences, Vol. 6, p. 60.

Hicoria pecan (Marsh.) Britton. Usually a slender tree, 60-100 feet or more high, bark somewhat rough, at length shaggy; leaflets 11-13, oblong-lanceolate, short-stalked, acuminate; staminate aments fascicled; middle lobe of the staminate calyx linear, longer than the oblong lateral lobes; fruit oblong-cylindrical; husk thin, 4-valved; nut oblong-cylindrical, smooth, thin-shelled, 2-celled below; seed edible. *Juglans pecan* Marsh. Arb. Am. 69, 1785; *Carya olivaeformis* Nutt. Gen. 2: 221, 1818; *Hicoria pecan* Britton, Bul. Torr. Bot. club, 15: 282, 1888.

This hickory, commonly known as the pecan, occurs on river bottoms and is infrequent or rare within our limits. The wood of this species is heavy, hard, rather brittle, close-grained, compact, and is reckoned of little value in comparison with the wood of our other species. The nuts, however, are sweet and edible and are an important article of commerce, but Iowa affords very little, if any, of the supply. Dr. White reported the species as belonging to the flora of Iowa.

Professor Pammel reported the species from Woodbury county on the authority of Professor Hitchcock, also from Muscatine and Scott counties; the latter locality on the authority of Mr. Fluke. The State University herbarium has specimens from Muscatine and Louisa counties. Outside of the above four mentioned counties the species is not known to occur within our limits.

White, Geol. Sur. of Iowa, Vol. 1, p. 138; Bessey, Contr. to the Flora of Iowa, p. 119; Arthur, Contr. to the Flora of Iowa, p. 29; Pammel, Proc. Iowa Academy of Sciences,

Vol. 1, pt. 2, 1890-1891, p. 91; Vol. 3, p. 132; Gray's Manual, Ed. 6, p. 468; Britton and Brown, Illus. Flora, Vol. 1, p. 484; Sargent, Forest Trees of N. A., p. 132; Barnes, Reppert, and Miller, Proc. Davenport Acad. of Nat. Sciences, Vol. 8, p. 255; Reppert, Iowa Geol. Sur., Vol. 9, p. 386; Trelease, Seventh Rep. Mo. Bot. Gar., p. 32.

Hicoria minima (Marsh.) Britton. Bitter-nut. Swamp Hickory. A tree, commonly 20-60 feet high; bark close, rough; leaflets 7-9, lanceolate, or oblong-lanceolate, acuminate, sessile, the lateral somewhat falcate, puberulent at first, becoming nearly glabrous; fruit subglobose, narrowly 6-ridged; nut white, somewhat compressed, smooth, not angled, short-pointed, thin-shelled; seed very bitter; husk thin; valves connivent half-way. *Juglans alba minima* Marsh. Arb. Am. 68, 1785; *Juglans sulcata* Willd. Berl. Baumz. 154, 1796; *Carya amara* Nutt. Gen. 2: 222, 1818; *Hicoria minima* Britton, Bull. Torr. Bot. Club, 15: 284, 1888.

The wood of this species is heavy, very hard, strong, close-grained, but checking in drying. The wood is used for fuel, hoops, lumber, etc.,. The species is common and widely distributed in Iowa, though the greater number of trees are still young. The seed is inedible, being very bitter, sometimes used to adulterate other nuts of the same genus. Our specimens are from Johnson, Jefferson, Ringgold, Montgomery, Pottawattamie, and Shelby counties. We have observed the species in Winneshiek, Appanoose, Taylor, Page, and Fremont counties. The State University herbarium contains specimens from Delaware, Lee, Story, and Cerro Gordo counties. Professor Pammel reports the species from Woodbury, Boone, and Hardin counties; Mr. Reppert from Muscatine county; Professor Fink from Fayette county; Professor Macbride from Humboldt, Dickinson, and Dubuque counties; and Mr. J. P. Anderson, by note, from Lucas county. This species grows best on the lowlands, but frequently occurs on the uplands.

White, Geol. Sur. of Iowa, Vol. 1, p. 138; Bessey, Contr. to the Flora of Iowa in Fourth Report of Iowa Agr. Col., p. 119; Arthur, Contr. to the Flora of Iowa, p. 29; Hitch-

cock, Trans. St. Louis Acad. of Science, Vol. 5, p. 517; Shimek, Bul. Lab. Nat. Hist., S. U. I., Vol. 3, p. 210; Pammel, Proc. Iowa Acad. of Sciences, Vol. 1, pt. 2, 1890-1891, p. 91; Vol. 3, p. 132; Iowa Geol. Sur., Vol. 10, p. 312; Fitzpatrick, Proc. Iowa Acad. of Sciences, Vol. 5, p. 127 and p. 163; Vol. 6, p. 196; Iowa Geol. Sur., Vol. 8, p. 313; Cameron, Iowa Geol. Sur., Vol. 8, p. 198; Macbride, Iowa Geol. Sur., Vol. 7, p. 107; Vol. 10, p. 238 and p. 646; Barnes, Reppert, and Miller, Proc. Davenport Acad. of Nat. Sciences, Vol. 8, p. 256; Reppert, Iowa Geol. Sur., Vol. 9, p. 386.

Hicoria ovata (Mill.) Britton. Shag-bark, Shellbark Hickory. Tree 30-70 feet or more high; bark of the trunk shaggy in narrow plates, young twigs and leaves puberulent, at length glabrous; leaflets usually 5, oblong-lanceolate or obovate, acuminate, finely serrate, sessile, the two lower smaller; staminate aments in 3's, on slender peduncles, at the bases of shoots of the season; middle lobe of the staminate calyx linear, twice the length of the lateral lobes; fruit subglobose, valves of the husk distinct, thick, four; nut white, somewhat flattish, rather thin-shelled, 4-celled below, 2-celled above; seed edible, sweet. *Juglans ovata* Mill. Gard. Dict., Ed. 8, No. 6, 1768; *Carya alba* Nutt. Gen. 2: 221, 1818, not *Juglans alba* L.; *Hicoria ovata* Britton, Bull. Torr. Club, 15: 283, 1888.

This is one of our most important trees, and the wood is much used for wagons, carriages, handles, agricultural implements, etc. The wood is heavy, hard, strong, close-grained and flexible. The species grows in rich upland woods, and is common throughout the state. The nuts are extensively gathered and sold in the market. Fuel is also obtained from this species.

Parry, in Owen's Geol. Sur. Wis., Iowa, and Minn., p. 618; White, Geol. Sur. of Iowa, Vol. 1, p. 138; Bessey, Contr. to the Flora of Iowa in Fourth Report of Iowa Agr. Col., p. 119; Arthur, Contr. to the Flora of Iowa, p. 29; Nagel and Haupt, Proc. Davenport Acad. of Nat. Sciences, Vol. 1, p. 163; Hitchcock, Trans. St. Louis Acad. of Science, Vol. 5, p. 517; Pammel, Iowa Geol. Sur., Vol. 10, p. 312; Fitzpatrick, Proc. Iowa Acad. of Sciences, Vol. 5, p.

127 and p. 163; Iowa Geol. Sur., Vol. 8, p. 313; Cameron, Iowa Geol. Sur., Vol. 8, p. 198; Macbride, Iowa Geol. Sur., Vol. 4, p. 119; Vol. 7, p. 107; Vol. 10, p. 646; Gow, Proc. Iowa Acad. of Sciences, Vol. 6, p. 62; Barnes, Reppert, and Miller, Proc. Davenport Acad. of Nat. Sciences, Vol. 8, p. 255; Reppert, Iowa Geol. Sur., Vol. 9, p. 386.

Hicoria laciniosa (Mx. f.) Sarg. Big Shag-bark. King-nut. Height about the same and bark similar to the preceding; leaflets 7-9, oblong-lanceolate or obovate, acuminate; staminate aments in 3's, at the base of the shoots of the season; middle lobe of the staminate calyx linear, twice the length of the lateral lobes; fruit oval, 4-ribbed, husk thick, nut large, oblong, pointed at both ends, thick-shelled, yellowish, somewhat angular; seed edible, sweet. *Carya sulcata* Nutt. Gen. 2: 221, 1818, not *Juglans sulcata* Willd., 1796; *Juglans laciniosa* Mx. f. Hist. Arb. Am. 1: 199, pl. 8, 1810. *Hicoria sulcata* Britton, Bull. Torr. Club, 15: 283, 1888; *Hicoria laciniosa* Sarg. Mem. Torr. Club, 5: 354, 1894.

The wood is heavy, very hard, tough, strong, flexible, close-grained, and is used for the same purposes as the wood of the preceding species. The fruit is about two inches long or less and about two-thirds as thick. The nut is about an inch in length and is sweet and edible. The species has a rather limited distribution in Iowa, but in some localities it is very common. In Appanoose county, along the Chariton bottoms, are many fine trees; in fact, the species is common along the river throughout its course in the county, and in times past many hundreds of bushels of nuts were gathered and sent to northern and eastern markets. Farther west in Decatur county a number of trees were to be found in the valley of Grand river. We have seen specimens in the State university herbarium from Muscatine, Louisa, and Van Buren counties; Messrs. Nagel and Haupt report the species from Scott county, Professor Shimek from Clinton and Wayne counties, Professor Macbride doubtfully from Johnson county; and we are creditably informed that the species occurs in Jefferson county.

Nagel and Haupt, Proc. Davenport Acad. of Nat. Sciences, Vol. 1, p. 163; Shimek, Bul. Lab. Nat. Hist., S. U. I., Vol. 3, p. 209; Pammel, Proc. Iowa Acad. of Sciences, Vol. 1, pt. 2, 1890-1891, p. 91; Fitzpatrick, Proc. Iowa Acad. of Sciences, Vol. 5, p. 167; Iowa Geol. Sur., Vol. 8, p. 313; Macbride, Iowa, Geol. Sur., Vol. 7, p. 107; Britton and Brown, Ills. Flora, Vol. 1, p. 486; Barnes, Reppert, and Miller, Proc. Davenport Acad. of Nat. Sciences, Vol. 8, p. 255; Reppert, Iowa Geol. Sur., Vol. 9, p. 386. Trelease, Seventh Rep. Mo. Bot. Gar., p. 40.

Hicoria alba (L.) Britton. White-heart Hickory. Mockernut. Tree growing about 80 feet high, bark not shaggy but rough and close; leaves and twigs persistently tomentose-pubescent, fragrant when crushed; leaflets 7-9, oblong-lanceolate or the upper oblanceolate or obovate, acuminate; staminate aments in 3's, peduncled; middle lobe of the staminate calyx linear, much exceeding the lateral lobes; fruit nearly or quite globose; husk thick; nut grayish white, angled, pointed above, somewhat compressed, thick-shelled, 4-celled below; seeds edible, sweet. *Juglans alba* L. Sp. Pl. 997, 1753; *Juglans tomentosa* Lam. Encycl. 4: 504, 1797; *Carya tomentosa* Nutt. Gen. 2: 221, 1818; *Hicoria alba* Britton, Bull. Torr. Bot. Club, 15: 283, 1888. *

The wood of this species has much the same characteristics and the same uses as the two preceding species. The species has an extensive range, being found from Massachusetts and Ontario to Nebraska, south to Florida and Texas. Its range in Iowa is quite limited and confined to the eastern side. Our specimens are from Muscatine county, where we found the species occupying rich uplands, and it appeared to be the common species. The close, rough bark and tomentose leaves and twigs give the species an aspect quite distinct from any other hickory. All the trees which we noticed were small and seemed to be of second growth. We understand that the species occurs in Scott county, and Prof. Pammel has reported it from Johnson county.

Arthur, Contr. to the Flora of Iowa, p. 29; Pammel, Proc. Iowa Acad. of Sciences, Vol. 1, pt. 2, 1890-1891, p. 91;

Barnes, Reppert, and Miller, Proc. Davenport Acad. of Nat. Sciences, Vol. 8, p. 255; Reppert, Iowa Geol. Sur., Vol. 9, p. 386; Trelease, Seventh Annual Rep. Mo. Bot. Gar., p. 39.

Hicoria glabra (Mill.) Britton. Pig-nut Hickory. This species has been reported as occurring in Iowa by various authors, but its existence has not been confirmed by subsequent botanists and no specimens are at hand. The fruit of the species is obovoid or ovoid-oblong, about two inches long or less; husk thin; valves tardily dehiscent; nut angled pointed, thin-shelled; seed not edible, bitter. *Juglans glabra* Mill. Gard. Dict. Ed. 8, No. 5, 1768; *Carya porcina* Nutt. Gen. 2: 222, 1818; *Hicoria glabra* Britton, Bull. Torr. Bot. Club, 15: 284, 1888.

Messrs. Nagel and Haupt report the species from Scott county; Prof. Macbride from Allamakee and Johnson counties; and Mr. Gow reports *Carya glabra* Torrey (which is a synonym of the above species) from Adair county, but probably *Carya amara* Nutt. (*Hicoria minima* (Marsh.)-Britton.) was intended.

Nagel and Haupt, Proc. Davenport Acad. of Nat. Sciences, Vol. 1, p. 163; Macbride, Iowa Geol. Sur., Vol. 4, p. 119; Vol. 7, p. 107; Gow, Proc. Iowa Acad. of Sciences, Vol. 6, p. 62.

HYBRIDS.

Mr. Reppert, of Muscatine, has collected in Muscatine county certain forms of hickories that have been published as hybrids. One form was published by Professor Shimek in Bul. Lab. Nat. Hist., S. U. I., Vol. 3, p. 210, as *Carya sulcatu X olivæformis*. (*Hicoria laciniosa* X *Hicoria pecan*.) Professor Trelease in the Seventh Report Mo. Bot. Gard., p. 41, says that a supposed hybrid of *Hicoria laciniosa* and *H. pecan* was described by Mr. Fuller in the New York Weekly Tribune, July 9, 1892, as cultivated by Mr. R. M. Floyd, of Cedar Rapids, Iowa. Professor Trelease further considers (p. 39) certain forms contributed by Mr. Reppert and seems to consider them as hybrids of *Hicoria alba* and *H. pecan* (*C. tomentosa* and *C. olivæformis*), and on page 33 other forms as hybrids of *Hicoria*

pecan and *H. minima*. (*C. olivæformis* and *C. amara*.) Barnes, Reppert, and Miller in their Flora of Scott and Muscatine counties mention two hybrids as occurring in the big timber near Muscatine, namely, *Carya olivæformis* X *C. tomentosa* and *Carya olivæformis* X *C. amara*.

BETULACEAE OF IOWA.

BY T. J. AND M. F. L. FITZPATRICK.

BETULACEÆ Agardh, Aphor. 208, 1825.

THE BIRCH FAMILY.

The Birch family as now understood, comprises six genera and about seventy-five species, mostly natives of the northern hemisphere. Some authors include this family with the Oak or Beech family under the name of CUPULIFERÆ. The chief distinction is the arrangement of the pistillate flowers. The Birch family has the pistillate flowers in aments while the Oak family has the pistillate flowers subtended by an involucre which becomes a bur or cup in fruit.

The family may be briefly characterized as trees or shrubs, with alternate petioled simple leaves, deciduous stipules, and monœcious flowers. The sterile flowers are in oblong or subglobose pendulous aments; stamens 2-10, inserted at the base of the regular or scale-like calyx; anthers 2-celled, the cells adnate or distinct. Pistillate aments erect, spreading or drooping, spicate or capitate; calyx adnate to the ovary, sometimes wanting. Ovary 1-2-celled, with 1-2 ovules in each cell; style 2-cleft or 2-parted. Fruit a one-celled, one-seeded nut, solitary or clustered, and usually involucrate. In most cases the fruits should be collected for certain identification.

Iowa has within its borders only seven species distributed through five genera. Only one species, the hazel-nut, is distributed throughout the state. All the others have a

decided preference for the eastern half of the state. The alder and the cherry birch are local or quite limited in their distribution, the former occurring in northeastern Iowa, while the latter may be found in central Iowa. The paper birch occurs in northeastern Iowa, a region noted for many species found nowhere else in our state.

* *Staminate flowers, 3—6 together; fruit destitute of an involucre, winged.*

BETULA. Stamens, 2; filaments, 2-cleft; each division with an anther cell.

ALNUS. Stamens, 4; filaments, simple; anther cells, adnate.

** *Staminate flowers solitary; fruit involucre, wingless.*

CORYLUS. Nut enclosed by a leafy involucre.

OSTRYA. Nut at the base of an oblong enclosed bag.

CARPINUS. Nut subtended by a large foliaceous bract.

Betula nigra L. Sp. Pl. 982, 1753. Red or River Birch. A tree, usually thirty to sixty feet high and one to two feet in diameter, with reddish or greenish brown bark, and reddish twigs; peduncles, shoots, and petioles soft downy; leaves rhombic-ovate, acute at both ends, irregularly doubly-serrate, downy beneath when young; nutlet one-seeded, one-celled, broadly winged. *Betula lanulosa* Mx. Fl. Bor. Am. 2, 181.

The species is frequent in the eastern half of the state, less frequent elsewhere. The wood is hard, brown, strong, and of rather light weight. The bark from the branches separates into membranous layers. The species occurs in alluvial soil along rivers. The wood is used for fuel and to some extent for lumber which is used in furniture. The pioneers made ox-yokes from this birch.

Our specimens are from Johnson and Decatur counties. We have observed the species in Allamakee, Clayton, Dubuque, Jackson, Clinton, Wapello, Linn, Appanoose, Jefferson, and Ringgold counties. The State university herbarium has specimens from Delaware, Scott, Muscatine, Louisa, Des Moines, and Polk counties. Professor Fink reports the species from Fayette county; Professor Pammel from Hardin county; and Mr. Mills by letter from Henry county.

White, Geol. Sur. Iowa, Vol. 1, p. 138; Arthur, Contr. to the Flora of Iowa, p. 29; Sargent, Forest Trees of North America, p. 161; Pammel, Proc. Iowa Acad. of Sciences, Vol. 1, pt. 2, 1890-91, p. 91; Iowa Geol. Sur., Vol. 10, p. 312;

Fink, Proc. Iowa Acad. of Sciences, Vol. 4, p. 101; Fitzpatrick, Proc. Iowa Acad. of Sciences, Vol. 5, p. 127, and p. 163; Vol. 6, p. 196; Cameron, Iowa Geol. Sur., Vol. 8, p. 198; Macbride, Iowa Geol. Sur., Vol. 4, p. 119; Vol. 7, p. 107; Vol. 9, p. 152; Vol. 10, p. 647; Reppert, Iowa Geol. Sur., Vol. 9, p. 386; Britton and Brown, Ills. Flora, Vol. 1, p. 509.

Betula lutea Mx. f. Arb. Am., 2: 152, Pl. 5, 1812.

This species is reported by Barnes, Reppert, and Miller from Scott and Muscatine counties in Proc. Davenport Academy of Natural Sciences, Vol. 8, p. 256. They state that the species is common along rivers. They mention no other birch, and as Mr. Reppert had only shortly before reported *Betula nigra* L. as common along streams in Muscatine county in his article, Forest Trees and Shrubs in Muscatine County, published in volume 9 of the Iowa Geological Survey, there seems a probable error. Britton and Brown give the range of this species as Newfoundland to Manitoba, south to North Carolina and Tennessee, mainly in the Alleghanies. In all probability *Betula nigra* L. was the species considered and that *Betula lutea* Mx. f. does not occur in Iowa.

Betula papyrifera Marsh. Arb. Am., 19, 1785. Paper or Canoe Birch. A tree, usually thirty to sixty feet high, usually one to two feet in diameter, with chalky white bark separable into very thin sheets, and brownish twigs; leaves ovate, acuminate, unequally doubly serrate, slender petioled, base obtuse to subcordate, glabrous and green above, glandular and somewhat pubescent beneath.

This species is frequent in rich woods, along streams, in northeastern Iowa. The wood is light, strong, tough, close-grained; mostly used for fuel in Iowa; may be used in the manufacture of spools, shoe-lasts, pegs, turnery, etc. The tough bark separating easily into thin layers is very durable and impervious to water, and has been used by the Indians in the manufacture of canoes and tents.

Our specimens are from Winneshiek county. We have observed the species in Allamakee, Clayton, and Dubuque counties. The State University herbarium has specimens from Delaware county. Professor Fink reports the species

from Fayette county; Professor Macbride from Humboldt county; Professor Pammel from Hardin county; and Messrs. Nagel and Haupt from Scott county. *Betula alba* var. *populifolia* Winchell, in Ludlow's Rep. Black Hills, 67, not Spach, is a synonym, and is the name given by Professor Bessey for this species in his contributions to the Flora of Iowa.

Bessey, Contr. to the Flora of Iowa, p. 119; Arthur, Contr. to the Flora of Iowa, p. 29; Nagel and Haupt, Proc. Davenport Acad. of Nat. Sciences, Vol. 1, p. 163; Pammel, Proc. Iowa Acad. of Sciences, Vol. 1, pt. 2, 1890-1891, p. 91; Iowa Geol. Sur., Vol. 10, p. 312; Fink, Proc. Iowa Acad. of Sciences, Vol. 4, p. 101; Cameron, Iowa Geol. Sur., Vol. 8, p. 198; Macbride, Iowa Geol. Sur., Vol. 4, p. 119; Vol. 10, p. 646; Fitzpatrick, Proc. Iowa Acad. of Sciences, Vol. 5, p. 127.

Betula lenta L. Sp. Pl. 983, 1753. Cherry Birch. A tree much resembling the cherry, growing forty to sixty feet or more high, with dark brown, smooth bark, which becomes furrowed, but does not separate in layers like our other species, and ovate or ovate-oblong, acute or acuminate, sharply serrulate, short-petioled leaves. Pistillate aments sessile, at the ends of short branches, oblong, proportionately thick, dense.

The range for this species as given by Britton and Brown is Newfoundland to western Ontario, Florida and Tennessee. This places Iowa far west of the supposed range, yet Professor Pammel reports the species from central Iowa, the locality being Steamboat Rock, Hardin county. He says: "Some large trees one foot in diameter occur in moist woods below the sandstone ledges. Much of the birch has been removed. This is very valuable wood and is much used by cabinet makers. Its occurrence in central Iowa is quite unusual."

Pammel, Iowa Geol. Sur., Vol. 10, p. 312.

Alnus incana (L.) Willd. Speckled or Hoary Alder. A shrub, eight to twenty feet high, and about one foot or less in diameter, with glabrous twigs, and pubescent shoots; leaves ovate or oval, acute, usually whitened and downy

beneath; stipules oblong-lanceolate; fruit orbicular, coriaceous-margined. *Betula alnus* var. *incana* L. Sp. Pl. II, Ed. 2, 1394, 1763; *Alnus incana* Willd. Sp. Pl. 4, 335, 1805.

The wood of this species is light brown, close-grained, soft, light, and checks in drying. In New England it is said to be used in the final baking of bricks and in the manufacture of gunpowder.

According to Professor Macbride, this species is common along the Yellow river in Allamakee county. Specimens from Allamakee and Jones counties are in the State university herbarium. Professor Arthur reports the species from Floyd county.

Arthur, Contr. to the Flora of Iowa, p. 29; Flora of Floyd County in History of Floyd County, p. 310; Botanical Gazette, Vol. 7, p. 127; Macbride, Iowa Geol. Sur., Vol. 4, p. 119.

Corylus americana Walt. Fl. Car. 236, 1788. Hazel-nut. A shrub, four to eight feet high, growing in clumps, young shoots hispid, twigs glabrous; leaves ovate, acuminate, serrulate all around, petioled, glabrous above, tomentulose beneath, base obtuse to cordate; involucre of two leaf-like laciniately margined pubescent bractlets, exceeding the oval or oblong nut.

This species makes up much of our thickets. We have observed thickets covering hundreds of acres composed mostly of this hazel with an occasional shrubby bur oak, red haws, plums, etc. Under present conditions the hazel is found along the highway, open upland woods, and uncleared thickets. The only economic value which this species possesses is the use of its fruit which is ripe in August and September. The nuts are small, somewhat striate, compressed, light brown, a half inch or less in length. These nuts have been gathered to a considerable extent and sold in the markets. The difficulty in hulling them has retarded their greater use. A certain species of chipmunk store up quantities of hulled nuts in burrows and some gatherers, knowing the habits of these rodents, systematically rob them of their winter's store much to the profit of the gatherers.

Our specimens are from Johnson, Van Buren, Decatur, Ringgold, Page, and Shelby counties. We have observed the species in Winneshiek, Allamakee, Dubuque, Muscatine, Wapello, Appanoose, Clarke, Adams, Montgomery, and Pottawattamie counties. The State University herbarium has specimens from Winnebago, Emmet, Cerro Gordo, Delaware, Dallas, Webster, Jasper, and Dickinson counties. Professor Bessey reports the species from Story, Fayette, and Des Moines counties; Professor Pammel from Woodbury and Boone counties; Messrs. Nagel and Haupt from Scott county; Professor Macbride from Humboldt county; Mr. J. P. Anderson, by note, from Lucas county; and Mr. Mills, by letter, from Henry county.

Parry, in Owen's Report Geol. Sur. Wis., Iowa, and Minn., p. 618; Bessey, Contr. to the Flora of Iowa, p. 119; Arthur, Contr. to the Flora of Iowa, p. 29; Hitchcock, Trans. St. Louis Acad. of Science, Vol. 5, p. 517; Nagel and Haupt, Proc. Davenport Acad. of Nat. Sciences, Vol. 1, p. 163; Pammel, Proc. Iowa Acad. of Sciences, Vol. 3, p. 132; Iowa Geol. Sur., Vol. 5, p. 237; Vol. 9, p. 240; Fink, Proc. Iowa Acad. of Sciences, Vol. 4, p. 101; Fitzpatrick, Proc. Iowa Acad. of Sciences, Vol. 5, p. 127; Vol. 5, p. 163; Vol. 6, p. 196; Iowa Geol. Sur. Vol. 8, p. 313; Cameron, Iowa Geol. Sur., Vol. 8, p. 198; Macbride, Iowa Geol. Sur., Vol. 7, p. 107; Vol. 9, p. 152; Vol. 10, p. 238 and p. 647; Reppert, Iowa Geol. Sur., Vol. 9, p. 386; Barnes, Reppert, and Miller, Proc. Davenport Acad. of Nat. Sciences, Vol. 8, p. 256; Arthur, Flora of Floyd county, in History of Floyd County, p. 309; Bot. Gaz., Vol. 7, p. 127.

Corylus rostrata, Ait. Hort. Kew., 3: 364, 1789. Beaked hazelnut. Professor Bessey reports this species from Fayette county in his contribution to the Flora of Iowa in the Fourth Report of the Iowa Agricultural College. No other observer has recorded this species as occurring in Iowa, although the state is within the range of the species. We very much doubt if this species has ever been collected in Iowa.

Ostrya virginiana (Mill.) Willd. Hop-hornbeam. Ironwood. A tree, twenty to fifty feet high, with grayish, furrowed bark; leaves ovate or oblong-ovate; acuminate,

sharply and doubly serrate, glabrous above, downy beneath, short-petioled; flowers appearing before or with the leaves; nut small, smooth, ovoid-oblong, sessile at the base of a large inflated oblong closed bag formed from the bractlet, the loosely imbricated involucre hop-like, bristly-hairy at the base. *Carpinus virginiana* Mill. Gard. Dict., Ed. 8, 1768; *Ostrya virginica* Willd. Sp. Pl. 4: 469, 1805.

This species occurs on wooded bluffs and is frequent throughout the state. The flowers appear in April and May and the fruit is ripe in July and August. The wood is dense, strong, durable, and valuable for constructions requiring great strength.

Our specimens are from Winneshiek, Johnson, Henry, Decatur, Union, and Fremont counties. We have observed the species in Allamakee and Clayton counties. The State University herbarium has specimens from Emmet, Calhoun, Cerro Gordo, Webster, Delaware, Lee, and Pottawattamie counties. Professor Pammel reports the species from Harrison, Boone, Hardin, and Woodbury counties; Professor Bessey, from Story and Des Moines counties; Professor Arthur, from Floyd county; Professor Fink, from Fayette county; and Professor Macbride, from Dubuque, Dickinson, and Humboldt counties.

Bessey, Contr. to the Flora of Iowa, p. 119; Arthur, Flora of Floyd county, in History of Floyd County, p. 300; Botanical Gazette, Vol. 7, p. 127; Contr. to the Flora of Iowa, p. 29; Hitchcock, Trans. St. Louis Acad. of Science, Vol. 5, p. 517; Pammel, Proc. Iowa Acad. of Sciences, Vol. 3, p. 132; Iowa Geol. Sur., Vol. 5, p. 237; Vol. 9, p. 240; Vol. 10, p. 312; Fink, Proc. Iowa Acad. of Sciences, Vol. 4, p. 101; Fitzpatrick, Proc. Iowa Acad. of Sciences, Vol. 5, p. 127 and p. 163; Vol. 6, p. 196; Iowa Geol. Sur., Vol. 8, p. 313; Cameron, Iowa Geol. Sur., Vol. 8, p. 198; Macbride, Iowa Geol. Sur., Vol. 4, p. 119; Vol. 7, p. 107; Vol. 9, p. 152; Vol. 10, p. 238 and p. 647; Reppert, Iowa Geol. Sur., Vol. 9, p. 386; Shimek, Iowa Geol. Sur., Vol. 10, p. 162; Barnes, Reppert, and Miller, Proc. Davenport Acad. of Nat. Sciences, Vol. 8, p. 256; Rigg, Notes on the Flora of Calhoun County, p. 25; Sargent, Forest Trees of N. A., p. 158.

Carpinus caroliniana Walt., Fl. Car., 236, 1788. Ameri-

can Hornbeam. Blue Beech. A small tree, ten to thirty feet high, with smooth bluish gray bark; leaves ovate-oblong, acute or acuminate, doubly serrate, base rounded to subcordate, short-petioled, both sides green, glabrous above, somewhat pubescent on the veins beneath; bractlets veiny, 3-lobed at the base, the middle lobe twice the length of the lateral ones, sparingly toothed; fruit a small ovoid nut, which is borne at the base of a large bractlet.

This species is frequent in the northeastern and eastern portions of Iowa. It occurs in woods near streams and blooms in April and May, while the fruit ripens in August and September. The majority of the individuals are but little better than mere shrubs or bushes. The wood is hard, strong, of a light brown color, and is very durable. Owing to the scarcity and small size of the species the wood has but little utility in Iowa, though for small articles, as levers, handles, etc., nothing better could be used.

Specimens in our collection are from Muscatine and Johnson counties. We have observed the species in Allamakee, Clayton, Dubuque, Des Moines, Van Buren, and Wapello counties. The State University herbarium has specimens from Emmet, Delaware, Henry, and Lee counties. Professor Bessey reports the species from Boone county; Professor Pammel, from Hardin county; Professor Fink, from Fayette county; Messrs. Nagel and Haupt, from Scott county; and Professor Macbride, from Humboldt county.

Bessey, Contr. to the Flora of Iowa, p. 119; Arthur, Contr. to the Flora of Iowa, p. 29; Nagel and Haupt, Proc. Davenport Acad. of Nat. Sciences, Vol. 1, p. 163; Fink, Proc. Iowa Acad. of Sciences, Vol. 4, p. 101; Fitzpatrick, Proc. Iowa Acad. of Sciences, Vol. 5, p. 127 and p. 163; Pammel, Iowa Geol. Sur., Vol. 5, p. 237; Vol. 8, p. 314; Vol. 10, p. 312; Cameron, Iowa Geol. Sur., Vol. 8, p. 198; Macbride, Iowa Geol. Sur., Vol. 4, p. 119; Vol. 7, p. 107; Vol. 9, p. 152; Vol. 10, p. 647; Reppert, Iowa Geol. Sur., Vol. 9, p. 386; Gray's Manual, 6th Ed., p. 474; Barnes, Reppert, and Miller, Proc. Davenport Acad. of Nat. Sciences, Vol. 8, p. 256; MacMillan, Met. Minn. Valley, p. 186.

THE FAGACEAE OF IOWA.

BY T. J. AND M. F. L. FITZPATRICK.

FAGACEAE Drude, Phan., 409, 1879.

OAK OR BEECH FAMILY.

The oak family comprises five genera and 375 species. The family is of wide geographical distribution, and from an economic point of view, of very great value. Four genera occur in the United States, namely, *Fagus* (the Beech), *Castanea* (the Chestnut), *Quercus* (the Oak), and *Castanopsis*. The number of species and varieties recognized is 87. Of this number 82 belong to the genus *Quercus*, one each to *Fagus* and *Castanopsis*, and three to *Castanea*. The only genus indigenous to Iowa is *Quercus*, the oak, and the number of species recognized is 15. The chestnut, *Castanea dentata* (Marsh.) Borkh. has been planted in some communities and seems to thrive. A fine grove of this species may be seen in the southern part of Johnson county and solitary or few trees that are hardy, ornamental, and useful are infrequently observed near dwellings. As the species ranges from Maine to Michigan, south to Tennessee, Iowa may be said to occupy a geographical position suited to chestnut raising. The wood of the species is coarse-grained and very durable. The beech, *Fagus americana* Sweet, ranges from Nova Scotia to Florida, westward to Wisconsin and Texas, but occurs nowhere in Iowa, yet the species might very naturally be expected. The beech belongs to a rather numerous class of species that may be found to the north, east, or south of Iowa, yet refuses to enter within our limits, or if at all, only in very restricted localities in the north-eastern or eastern portions of the state.

The oak has been looked upon as the peer of forest trees; aye, even taken as the symbol of strength. Its close, strong fibers enable the tree to resist a thousand storms. Its vitality readily causing a new growth to be rapidly spread over the narrow path riven by the lightning. Some of the species live several hundred years ere storms, fungi, accidents, and natural old age have at last consumed the tree's vitality and death results.

Let us pass through a native oak grove of eastern Iowa. At first we shall be struck by the remarkable paucity of large trees, though here and there fine ones are seen. Further observation, however, reveals many decaying stumps, clearly indicating the cause of the scarcity. In place of the primeval there are numerous young trees which collectively constitute the so-called second growth. On noticing species we find they bear a rather general numerical relation to each other. Sometimes one species predominating, and again another, so as to receive the distinctive names of white oak, bur oak, or the so-called black oak groves. One particular grove on the uplands is composed largely of scarlet oak (*Q. coccinea* Wang.); the trees are thick set, limby or not, as is convenient for them; stately, thriving or passive as the seasons of average moisture or drought appear. Here and there may be seen a solitary red oak (*Q. rubra* L.), or at best but few individuals, for they seem not to thrive in numbers where the scarlet oak abounds. The bur oak (*Q. macrocarpa* Mx.) fares better, though not many individuals may be counted in close proximity with the scarlet oak, yet passing in certain directions we find the number increasing until we are in a typical bur oak grove. We said we were on the uplands, but we find on passing to the lowlands that the bur oak is there. The trees are large, but the quality of the timber is comparatively poor. The white oak (*Q. alba* L.) has much the same habit as the bur oak. Solitary individuals occurring among the scarlet oaks and in certain places predominating, though as we pass from point to point we may find white oaks mixed with bur oaks along with scarlet oaks, until differentiated by natural causes

into predominant or subordinate numerical positions. Let us pass over to the bluff side next the river, and here we may expect to find a few chestnut oaks (*Q. acuminata* Mx.)-Sarg. As the chestnut oaks we usually find are few and small, we look upon them as curiosities in the oak line. Rarely do we find a Quercitron or black oak (*Q. velutina* Lam.) mixed in our typical oak grove.

Let us pass to southeastern or southern Iowa, and we find the relations of the bur, white, scarlet, and red oak remaining much the same as in eastern Iowa, except that the shingle oak (*Q. imbricaria* Mx.) or laurel oak, as it is called in Iowa, makes itself numerous on the uplands, displacing in many localities the scarlet oak. On the second bottoms we find the swamp white oak (*Q. platanoides* (Lam.) Ludw.) flourishing, and in the swampy portions of the lower bottom the pin oak (*Q. palustris* Du Roi) occurs abundantly. The swamp white oak and the pin oak sometimes intermingle on neutral ground, but not to mutual benefit. Returning to the uplands we find groves of black-jack or barren oak (*Q. marylandica* Muench) growing frequently on rather sterile soil. The trees are small, rough formed, apparently stunted, much branched, so much so that getting wood from these groves is slow and laborious. Infrequently we find a water oak (*Q. nigra* L.) in these black-jack groves. This species occurs along streams and swamps in the eastern portion of the United States, but in Iowa we have seen it only on the uplands. Passing out on the prairie we find many colonies of the ground or scrub chestnut oak (*Q. prinoides* Willd.). The species is small, only two or three feet high, of heavy root, and of no economic value save the acorns, which are stored by the prairie squirrels. The roots are a rather formidable obstacle to the breaking of the sod, taxing the patience of the breaker and the draft team. On the prairie, too, we find the bur oak. Instead of the fine, large trees we have scrubs, only a few feet high, but seemingly thriving, in small colonies, and apparently striving to be the prototype of a future forest.

In central and western Iowa we find the red oak frequently displacing the scarlet oak. The white oak is frequent, along with the bur oak, which is stately or shrubby, according to location. Occasionally a few chestnut oaks occur along the bluffs in central Iowa. In central Iowa is also found the Texan red oak (*Q. texana* Buckley), an unusual find. It will be seen that central and western Iowa have few species as compared with the eastern and southern portions. Forests are more extensive in the eastern portion. The larger rivers of the state are all eastern, and the Father of waters is our eastern border. The forest primeval established itself in a narrow strip along our eastern border, sending out branches of tenuous width up the tributaries. The forests of central and western Iowa are meager because they had to be established in a fire-swept zone and had not reached their fullness ere the advent of civilized man. The problem of forest conditions, especially near the rivers, having been solved in the eastern portion, there was opportunity for the increase of species. But the hardy ones were established first, and others followed. The forests of central and western Iowa had made their beginning. The sturdy species had stood the test on favorable ground, and others were following, but the advent of man changed conditions. He made the prairie a farm and converted the young forests into heat and building materials.

Passing backward in time for a space of fifty years we find the state but thinly settled and nearly all its inhabitants on the eastern side. There were many oak forests with fine, large oaks. The settler chose the best of convenient size to build his home. The sawmill on being brought and conveniently located was energetically employed in producing building materials to be used in the rising villages or on the farms. Thousands of trees were made into rails to be used in the old-fashioned worm fences. The advent of the railways caused an increase in the demand for oak timber for many years. The timber was rapidly disappearing and many citizens felt apprehensive. But as time goes on conditions change. The uni-

versal application of metals materially checked the strain on the timber resources, so that to-day our oak groves, as a rule, are suffering only from the demands for fuel and fence-posts, along with the greed for more pasture land. The opening of the large coal fields in southern Iowa materially reduces the fuel demand.

The Oak family may be characterized as trees or shrubs, with alternate petioled, pinnately-veined leaves, deciduous stipules, and small monœcious, apetalous flowers. The staminate flowers are in pendulous, sometimes erect or spreading aments, with a 4-7-lobed perianth, and 4-20 stamens. The pistillate flowers are solitary or several together, surrounded by an involucre composed of wholly or partially united bracts, which develop into a bur or cup. Perianth 4-8-lobed, adnate to the ovary. Ovary 3-7-celled; ovules 1-2 in each cell, pendulous, only one in each ovary developing. Represented in Iowa by the genus *QUERCUS* L. Sp. Pl. 994, 1753.

* Acorns maturing the first year; leaves not bristle-tipped
† Leaves deeply lobed or pinnatifid.

Quercus alba L. Sp. Pl. 996, 1753. White Oak. Bark light gray; leaves oblong or obovate-oblong, green above, smooth, pale or glaucous beneath, short-petioled, sinuate-pinnatifid; lobes linear or oblong, obtuse, entire or lobed, base acute; acorn ovoid-oblong, cup depressed-hemispheric, shallow, about one-third the height of the acorn; scales obtuse, appressed, woolly, at length glabrous, lower ones knotty.

This species occurs in upland woods, and is more or less common throughout the state. The wood is hard, tough, close-grained, of a brown color, and very strong, qualities which give utility and durability. Hence for construction materials the white oak is held in great esteem. The settlers drew from this oak materials for their houses, fences, etc. The trunks which were long and straight made excellent framing timbers, as sills, cross-beams, etc., unequaled rails or posts for fences, clapboards or shingles for roofs. On the advent of the local sawmills many trees were cut

and sawed into lumber. In the line of rail fences the white oak had no competitor for durability. Rails are now in use that have resisted the elements for forty years, though the average life cannot be stated to be so long, but is probably ten or fifteen years shorter. On the building of the railways large quantities of white oak timber were used for piling, bridge material, or ties; many of the ties being fashioned with a broad-ax driven by human power. The primeval trees are nearly all gone. The second growth consists of numerous individuals and constitutes the major portion of our white oak groves. The older trees range from sixty to one hundred feet in height and have a trunk diameter of from three to five feet. The young grove trees are from thirty to sixty feet in height, and are from four to ten inches in diameter. The former are usually much-branched, the branches rather large, while the latter are slender and with few or many small, slender branches. The second growth material gives excellent fuel, posts, small piling, etc.

Our specimens are from Johnson, Van Buren, Appanoose, and Decatur counties. We have observed the species in Winneshiek, Allamakee, Clayton, Jefferson, Wapello, Ringgold, and Union counties. The State University has specimens from Delaware, Louisa, Lee, Dallas, Webster, and Pottawattamie counties. Professor Bessey reports the species from Story and Des Moines counties; Professor Fink, from Fayette county; Professor Pammel, from Boone and Hardin counties; Mr. Reppert, from Muscatine county; Messrs. Nagel and Haupt, from Scott county; Professor Macbride, from Dubuque and Humboldt counties; Mr. Gow, from Adair county; and Mr. Mills, by letter, from Henry county.

White, Geol. Sur. of Iowa, Vol. 1, p. 138; Bessey, Contr. to the Flora of Iowa, p. 119; Arthur, Contr. to the Flora of Iowa, p. 29; Hitchcock, Trans. St. Louis Acad. of Science, Vol. 5, p. 517; Nagel and Haupt, Proc. Davenport Acad. of Nat. Sciences, Vol. 1, p. 163; Fink, Proc. Iowa Acad. of Sciences, Vol. 4, p. 101; Fitzpatrick, Proc. Iowa Acad. of Sciences, Vol. 5, p. 127 and p. 163; Vol. 6, p. 196; Iowa

Geol. Sur., Vol. 8, p. 314; Gow, Proc. Iowa Acad. of Sciences, Vol. 6, p. 61; Pammel, Iowa Geol. Sur., Vol. 5, p. 237; Iowa Geol. Sur., Vol. 9, p. 240; Vol. 10, p. 312; Cameron, Iowa Geol. Sur., Vol. 8, p. 198; Macbride, Iowa Geol. Sur., Vol. 4, p. 119; Vol. 7, p. 107; Vol. 9, p. 153; Vol. 10, p. 647; Reppert, Iowa Geol. Sur., Vol. 9, p. 386; Barnes, Reppert, and Miller, Proc. Davenport Acad. of Nat. Sciences. Vol. 8, p. 256.

Quercus minor (Marsh.) Sarg. Post or Iron Oak. Usually a small tree, with rough, gray bark, and broadly obovate, deeply lyrate-pinnatifid leaves which are dark green above and brown-tomentulose beneath; divisions 3 to 7, sometimes undulate or toothed; fruit sessile or nearly so; cup hemispheric, bracts lanceolate, subacute, slightly squarrose; acorn ovoid, two to three times the length of the cup. *Quercus alba minor* Marsh., Arb. Am. 120, 1785; *Quercus stellata* Wang., Amer. 78, Pl. 6, f. 15, 1787; *Quercus obtusiloba* Mx., Hist. Chen. Am., 1, Pl. 1, 1801; *Quercus minor* Sargent, Gard. and For. 2:471, 1889.

The wood of this species is hard, close-grained, brown, and very durable. The specific gravity of this oak is greater than any other, save one of our species. The small trees make excellent posts for wire fences. The rarity of the species in Iowa prevents its use to even a limited extent. So far as we know, it is found in Iowa only in Appanoose county, where we have observed the species for several years. It grows in dry soil on the upland ridges, where it occurs in small groves. The species is found in Michigan on the north, and southwestward in Texas, and extends as far east as Massachusetts. Professor Arthur includes the species in his catalogue under the name, *Quercus obtusiloba* Mx., but gives no locality.

Arthur, Contr. to the Flora of Iowa, p. 29; Fitzpatrick, Proc. Iowa Acad. of Sciences, Vol. 5, p. 163.

Quercus macrocarpa Mx., Hist. Chen. Am. 2, Pl. 23, 1801. Mossy-cup or Bur Oak. Tree 100-150 feet or more in height; sometimes shrubby, with gray, flaky, deeply-furrowed bark, the twigs rough or corky-winged; leaves

obovate or oblong-obovate, deeply sinuate-lobed or pinatifid, grayish, downy beneath; fruit sessile or short-peduncled; cup deep, one-half to quite enclosing the ovoid acorn, the scales thick, pointed, the upper subulate tipped, giving a fringed border.

This species is common in rich woods where it reaches its maximum development. It, however, persists in small groves on the exposed prairie where the trees are often little more than shrubs. It is a hardy tree, and gives valuable timber, though not held in so high esteem as the white oak. Primeval trees are now infrequent, but many are 100 to 150 feet high and four to five feet in diameter. The settlers drew heavily from this oak for rails, posts, lumber, framing timber, and fire wood. The young generation of trees would bid fair in time to equal or surpass their predecessors were it not that far too many find the ever needful woodpile an early resting place.

Specimens before us are from Johnson, Van Buren, Decatur, Ringgold, and Fremont counties. We have observed the species in Winneshiek, Allamakee, Clayton, Dubuque, Scott, Muscatine, Jefferson, Appanoose, Taylor, Page, Union, Adams, Montgomery, and Pottawattamie counties. The State University herbarium has specimens from Emmet, Winnebago, Floyd, Cass, Hancock, Webster, Dallas, Delaware, Louisa, Lee, Jasper, Dickinson, Woodbury, and Lyon counties. Professor Fink reports the species from Fayette county; Professor Bessey, from Story and Des Moines counties; Professor Pammel, from Hamilton, Hardin, and Boone counties; Professor Macbride, from Humboldt county; Mr. Gow, from Adair county; Mr. J. P. Anderson, by note, from Lucas county; and Mr. Mills, by letter, from Henry county, a total of forty-three counties. Doubtless there is not a county in the state that has not this species.

White, Geol. Sur. of Iowa, Vol. 1, p. 138; Bessey, Contr. to the Flora of Iowa, p. 119; Arthur, Contr. to the Flora of Iowa, p. 29; Hitchcock, Trans. St. Louis Acad. of Science, Vol. 5, p. 517; Nagel and Haupt, Proc. of the Davenport Acad. of Nat. Sciences, Vol. 1, p. 163; Pammel, Proc.

Iowa Acad. of Sciences, Vol. 3, p. 132; Iowa Geol. Sur., Vol. 5, p. 238; Vol. 10, p. 313; Fink, Proc. Iowa Acad. of Sciences, Vol. 4, p. 101; Fitzpatrick, Proc. Iowa Acad. of Sciences, Vol. 5, p. 127 and p. 163; Vol. 6, p. 196; Iowa Geol. Sur. Vol. 8, p. 314; Gow, Proc. Iowa Acad. of Sciences, Vol. 6, p. 61; Cameron, Iowa Geol. Sur., Vol. 8, p. 198; Macbride, Iowa Geol. Sur., Vol. 4, p. 119; Vol. 7, p. 107; Vol. 9, p. 153; Vol. 10, p. 238 and p. 648; Reppert, Iowa Geol. Sur., Vol. 9, p. 386; Shimek, Iowa Geol. Sur., Vol. 10, p. 163; Barnes, Reppert, and Miller, Proc. Davenport Acad. of Nat. Sciences, Vol. 8, p. 256.

††Leaves sinuate, crenate, or toothed.

Quercus platanoides (Lam.) Sudw. Swamp White Oak. Tree forty to one hundred feet high; bark gray, flaky; leaves obovate or oblong-obovate, base cuneate and entire, margin coarsely sinuate-crenate, white-downy beneath; acorns ovoid oblong, in pairs on long peduncles; cup hemispheric, scales lanceolate, pubescent, appressed, the upper acute or acuminate. *Quercus prinus platanoides* Lam., Encycl., 1:720, 1783; *Quercus bicolor* Willd., Neue Schrift, Ges. Nat. Fr., Berlin, 3: 396, 1801; *Quercus platanoides* Sudw., Rep. Secy. Agric., 1892:327, 1893.

The wood of this species is denser than the white oak, but not so dense as that of the post oak and is tough, hard, strong, and close-grained. So far as our observations go, trees rarely exceed eighteen or twenty inches in diameter. The wood is valuable for fuel, posts, lumber, etc. The species has a limited range in Iowa, though of frequent occurrence in that range. The small size of our trees prevents its use much beyond posts and fire wood. Our specimens are from Jefferson, Appanoose, Decatur, and Ringgold counties. Professor Pammel reports the species from Lee, Muscatine, and Clayton counties; and Messrs. Barnes, Reppert, and Miller, from Scott and Muscatine counties.

Arthur, Contr. to the Flora of Iowa, p. 29; Pammel, Proc. Iowa Acad. of Sciences, Vol. 1, pt. 2, 1890-1891, p. 91; Fitzpatrick, Iowa Geol. Sur., Vol. 8, p. 314; Proc. Iowa Acad. of Sciences, Vol. 5, p. 163; Vol. 6, p. 196; Barnes,

Reppert, and Miller, Proc. Davenport Acad. of Nat. Sciences, Vol. 8, p. 256; Sargent, Forest Trees of N. A., p. 141.

Quercus acuminata (Mx.) Sarg. Chestnut or Yellow Oak. A tree attaining large size; bark gray, flaky; leaves lanceolate or oblong, acute or acuminate, equally and coarsely toothed, slender-petioled, base obtuse or rounded, pale beneath; acorn globose; cup hemispheric, thin, shallow, subsessile; scales ovate, appressed. *Quercus prinus acuminata* Mx., Hist. Chenes Am. No. 5, Pl. 8, 1801; *Quercus muhlenbergii* Engelm., Trans. St. Louis Acad., Vol. 3, p. 391, 1877; *Quercus acuminata* Sarg., Gar. and For., Vol. 8, p. 93, 1895.

This species is frequent in eastern and southern Iowa, preferring rocky bluffs and bottoms. The wood is hard, dense, close-grained, durable, and of much strength. The specific gravity is the greatest of our species. This species gives valuable timber, and has been much used until the major portion of the large trees are all gone. Near Keosauqua are quite a number of large trees still growing, and Professor Pammel reports that fine, large trees are common in the valleys of Boone county. Our specimens are from Johnson, Des Moines, Van Buren, Henry, Appanoose, Decatur, Ringgold, and Fremont counties. We have observed the species in Union, Adams, and Montgomery counties. The State University herbarium has specimens from Jackson, Delaware, and Lee counties. Professor Macbride reports the species from Allamakee county; Professor Fink, from Fayette county; Messrs. Nagel and Haupt, from Scott county; Mr. Reppert, from Muscatine county; and Professor Pammel, from Boone and Clayton counties.

Arthur, Contr. to the Flora of Iowa, p. 29; Hitchcock, Trans. St. Louis Acad. of Science, Vol. 5, p. 518; Nagel and Haupt, Proc. Davenport Acad. of Nat. Sciences, Vol. 1, p. 163; Pammel, Proc. Iowa Acad. of Sciences, Vol. 1, pt. 2, 1890-1891, p. 91; Iowa Geol. Sur., Vol. 5, p. 238; Fink, Proc. Iowa Acad. of Sciences, Vol. 4, p. 101; Fitzpatrick, Proc. Iowa Acad. of Sciences, Vol. 5, p. 163; Vol. 6, p. 196; Iowa Geol. Sur., Vol. 8, p. 314; Cameron, Iowa Geol. Sur., Vol. 8, p. 198; Reppert, Iowa Geol. Sur., Vol. 9,

p. 386; Macbride, Iowa Geol. Sur., Vol. 4, p. 119; Vol. 7, p. 107; Barnes, Reppert, and Miller, Proc. Davenport Acad. of Nat. Sciences, Vol. 8, p. 256.

Quercus prinoides Willd., Neue Schrift, Ges. Nat. Fr. Berlin, 3:397, 1801. Ground Oak. This species much resembles the preceding; usually one to four feet high; leaves oval or obovate, coarsely toothed or undulate, shorter petioled; cups deeper, sessile; scales appressed, ovate or lanceolate; acorn ovoid. *Quercus prinus humilis* Marshall.

This species seems to differ from *Quercus acuminata* (Mx.) Sarg., by its low stature and leaf outline. Our experience indicates that this species has a well developed root system. The roots being comparatively large and much ramified. Small groves of this oak which we have seen grubbed made large heaps of roots, reminding one of brush heaps in clearings. These roots have suggested the common name of ground oak. Wherever this oak occurs there is considerable difficulty in breaking the prairie soil. So far we have observed this species only in Appanoose and Decatur counties, but in those counties it was a common species in dry prairie soil. Mr. J. P. Anderson informs us that it occurs in Lucas county. No doubt the species occurs in many of our southern counties. Dr. Vasey reports the species from Iowa.

Vasey, Am. Ent. and Bot., Vol. 2, p. 282; Bessey, Contr. to the Flora of Iowa, p. 119; Arthur, Contr. to the Flora of Iowa, p. 29; Fitzpatrick, Proc. Iowa Acad. of Sciences, Vol. 5, p. 163; Iowa Geol. Sur., Vol. 8, p. 314.

** Leaves bristle-tipped; acorns maturing the second year.

† Leaves deeply lobed or pinnatifid.

Quercus rubra L., Sp. Pl. 996, 1753. Red Oak. This species may be characterized as a large tree with reddish, coarse wood; leaves mostly oval in outline, deeply lobed, sinuses rounded, lobes somewhat triangular-lanceolate, remotely coarsely-toothed, pubescent when young, becoming mostly glabrous; acorn ovoid, one-fourth immersed; cup saucer-shaped, sessile or subsessile; scales ovate, obtuse

or the upper acute, appressed. *Quercus ambigua* Mx., f. Hist. Arb. Am., 2, 120, Pl. 24, 1812.

The red oak is a common tree of the upland woods, flowering in May and June, and ripening its acorns in October or November. With us individual trees rarely measure four feet in diameter, and the majority range from two to three feet. The bark is dark gray, and but slightly roughened on the branches, but is rarely deeply furrowed and darker colored on the trunk. The tree is a rapid grower, but gives coarse-grained wood from which inferior lumber may be sawed, or when dry, a rapid burning fire wood giving considerable heat may be had. Some use has been made of this oak for certain kinds of furniture. In the days of board fences this oak was taken by the farmers to local mills and made into six or eight-inch width lumber for fence material. The users claimed that the lumber from this species was less liable to warp than other available kinds. A limited use of the red oak for fence posts showed early decay of the portions in contact with the soil. This oak does very well for foundation piling.

The species ranges west of our limits to Kansas and Texas and eastward to Nova Scotia. Within our limits the primeval individuals have been mostly removed, but a sturdy second growth has taken their places. Our specimens are from Johnson, Appanoose, Decatur, Ringgold, Union, Page, Fremont, and Pottawattamie counties. We have observed the species in Winneshiek, Allamakee, Clayton, Wapello, Lee, Van Buren, Taylor, and Montgomery counties. The State University herbarium has specimens from Winnebago, Cerro Gordo, Dallas, Louisa, Webster, Emmet, and Delaware counties. Professor Macbride reports the species from Humboldt, Dickinson, and Dubuque counties; Professor Pammel, from Woodbury, Hardin, and Boone counties; Messrs. Nagel and Haupt, from Scott county; Professor Fink, from Fayette county; Professor Bessey, from Des Moines county; Messrs. Barnes, Reppert, and Miller, from Muscatine county; Mr. Gow, from Adair county; Mr. Mills, by letter, from Henry county; and Mr. J. P. Anderson, by note, from Lucas

county, a total of thirty-seven counties. In all probability the red oak occurs in every county in Iowa.

Bessey, Contr. to the Flora of Iowa, p. 119; Arthur, Contr. to the Flora of Iowa, p. 29; Hitchcock, Trans. St. Louis Acad. of Science, Vol. 5, p. 518; Nagel and Haupt, Proc. Davenport Acad. of Nat. Sciences, Vol. 1, p. 163; Pammel, Proc. Iowa Acad. of Sciences, Vol. 3, p. 132; Iowa Geol. Sur., Vol. 9, p. 240; Vol. 10, p. 313; Fink, Proc. Iowa Acad. of Sciences, Vol. 4, p. 101; Fitzpatrick, Proc. Iowa Acad. of Sciences, Vol. 5, p. 128 and p. 164; Vol. 6, p. 196; Iowa Geol. Sur., Vol. 8, p. 314; Gow, Proc. Iowa Acad. of Sciences, Vol. 6, p. 61; Cameron, Iowa Geol. Sur., Vol. 8, p. 198; Macbride, Iowa Geol. Sur., Vol. 4, p. 119; Vol. 7, p. 107; Vol. 9, p. 153; Vol. 10., p. 238 and p. 648; Reppert, Iowa Geol. Sur., Vol. 9, p. 387; Barnes, Reppert, and Miller, Proc. Davenport Acad. of Nat. Sciences, Vol. 8, p. 256; Sargent, Forest Trees of N. A., p. 148.

Quercus palustris DuRoi, Harbk., 2:268, Pl. 5, f. 4, 1772. Pin Oak. Leaves long-petioled, ovate, deeply pinnatifid, sinuses broad and rounded, lobes divergent, remotely coarsely toothed; acorn ovoid, one-third immersed; cup saucer-shaped, scales triangular ovate, acute or obtuse, appressed.

This species, commonly known as the swamp or pin oak, usually occurs in groves on river bottoms, often in swampy soil. The grove trees are tall, slender, and but little branched. Solitary trees in the open are much branched; the branches are long, slender, spreading, horizontal, or even drooping. The wood was used somewhat by the early settlers for rails, though inferior for the purpose; also, the long, slender trunks, when of proper size, were readily converted by a skillful woodman with a broad-ax, into framing timber for barns and other buildings. When properly seasoned and used for inside material the pin oak does very well. For wood or construction material requiring resistance to the elements, this species furnishes a poor quality.

In Iowa the pin oak has a very limited range. Our specimens are from Muscatine, Lee, Appanoose, and Decatur counties. The State University has a specimen from

Louisa county. Professor Macbride reports the species from Johnson county; Professor Bessey, from Des Moines county; and Messrs. Barnes, Reppert, and Miller, from Scott county. Thus it will be seen that there is a crescent distribution of this species in Iowa, the localities all being southeastern. The species ranges northward to Wisconsin, southward to Arkansas, eastward to Massachusetts and Delaware.

Bessey, Contr. to the Flora of Iowa, p. 119; Arthur, Contr. to the Flora of Iowa, p. 29; Pammel, Proc. Iowa Acad. of Sciences, Vol. 1, pt. 2, 1890-1891, p. 91; Fitzpatrick, Proc. Iowa Acad. of Sciences, Vol. 5, p. 164; Iowa Geol. Sur., Vol. 8, p. 314; Reppert, Iowa Geol. Sur., Vol. 9, p. 387; Macbride, Iowa Geol. Sur., Vol. 7, p. 107; Barnes, Reppert, and Miller, Proc. Davenport Acad. of Nat. Sciences, Vol. 8, p. 257.

Quercus texana Buckley, Proc. Phila. Acad., 1860:444, 1860. Texan Red Oak. This oak is very similar to *Quercus palustris* DuRoi, becoming a large tree; bark reddish-brown, with broad ridges; leaves obovate in outline, bright green above; paler and with tufts of wool in the axils beneath, deeply pinnatifid into 5-9 triangular or oblong lobes which are entire or coarsely few-toothed, the lobes and teeth bristle-tipped; acorn ovoid, 2-3 times the height of the deeply saucer-shaped cup; scales obtusish or acute, appressed.

The Texan red oak we have not seen. We include it on the authority of Professor Pammel, who states that it occurs at Webster City, Hamilton county. Britton and Brown refer the species to Iowa.

Pammel, Iowa Geol. Sur., Vol. 5, p. 238; Britton and Brown, Illust. Flora, Vol. 1, p. 517.

Quercus coccinea Wang., Amer. 44, p. 4, f. 9, 1787. Scarlet Oak. Becoming a large tree; bark internally reddish or gray; leaves deeply pinnatifid, glabrous and white green above, pale and somewhat pubescent in the axils of the veins beneath, becoming scarlet in autumn; acorn ovoid or ovoid-globose, one-half or more immersed; cup hemis-

pheric or top-shaped, scales triangular-lanceolate, appressed or the upper slightly squarrose, glabrate.

In eastern Iowa this oak is one of the principal trees of the young upland woods. The trees usually run from six to eighteen inches in diameter and twenty-five to forty feet high. Large trees are infrequent, owing to the fact that they have been removed and the time is too short since the prairie fires have been stopped or since the primeval trees have been destroyed for the new trees or the second growth ones to attain any considerable size. The wood is as heavy as the white oak, but not so strong or durable, and is coarse-grained. This oak makes up the bulk of the cord wood on the market in those portions of the state where coal is not a local output. The farmers also draw their supplies of firewood from the young groves of this species, especially since much has been winter-killed during the unseasonable winter of 1898-'99 and was seasoned standing. For the wood market the long, slender trees, the prevailing form in the groves, readily yields to the woodman's ax to form the conventional market wood. For the best results, the tree, if growing, should be felled about a year before market time, cut into four-foot lengths, and if necessary, split to convenient sizes and corded. When the wood is dry it is then delivered on the market to the consumers. The final preparation consists in sawing the cord sticks twice and splitting to convenient sizes. When dry the wood readily burns and gives much heat, but is not reckoned as a lasting wood. In those portions of the state where coal is an output this oak is much used for coal props. The young trees are selected and prepared in the same manner as in making cord wood, except the length of the pieces is about three and a half feet, but varies according to the thickness of the coal vein. These pieces having the ends sawed transversely are placed upright in the coal mines as the coal is removed to prevent the falling of the roof of the mine. In the rural districts a limited use of the oak for fencing may be observed, but such fences are short lived. The scarlet oak is sometimes used for foundation piling.

The flowers appear in May and June, and the acorns ripen in September and October. Within Iowa the species is widely distributed. The species ranges northward into Minnesota, southward into Missouri, eastward to Maine, but apparently not to the westward of Iowa. Our specimens are from Johnson, Appanoose, Decatur, Ringgold, Fremont, and Pottawattamie counties. We have observed the species in Allamakee, Dubuque, Jackson, Scott, and Taylor counties. The State University herbarium contains specimens from Delaware county. Professor Fink reports the species from Fayette county; Mr. Reppert, from Muscatine county; Professor Hitchcock, from Story and Blackhawk counties; Professor Macbride, from Humboldt county; and Mr. Mills, by letter, from Henry county.

Arthur, Contr. to the Flora of Iowa, p. 29; Hitchcock, Trans. St. Louis Acad. of Science, Vol. 5, p. 518; Fink, Proc. Iowa Acad. of Sciences, Vol. 4, p. 101; Fitzpatrick, Proc. Iowa Acad. of Sciences, Vol. 5, p. 128 and p. 164; Vol. 6, p. 196; Iowa Geol. Sur., Vol. 8, p. 314; Cameron, Iowa Geol. Sur., Vol. 8, p. 193; Macbride, Iowa Geol. Sur., Vol. 4, p. 119; Vol. 7, p. 107; Vol. 9, p. 153; Vol. 10, p. 648; Reppert, Iowa Geol. Sur., Vol. 9, p. 387; Sargent, Forest Trees of N. A., p. 148.

Quercus velutina Lam., Encycl., 1:721, 1783. Black Oak. Quercitron. This species very much resembles *Quercus coccinea* Wang.; the outer bark is dark brown, rougher, the inner bright orange; leaves pinnatifid or lobed to beyond the middle, brown-pubescent or stellate-pubescent when young, glabrous when mature, dull green above, pale green and usually pubescent on the veins beneath, leaf-lobes triangular-lanceolate or broad-oblong, usually coarsely toothed at the apex, lobes and teeth bristle-tipped; acorn ovoid, about twice the length of the cup, cup hemispheric or top-shaped, commonly short-stalked, scales more or less pubescent, the upper somewhat squarrose. *Quercus tinctoria* Bartram, Travels, 37, name only, 1791; *Quercus coccinea* var. *tinctoria* A. Gray, Man., Ed. 5, 454, 1867.

The Quercitron is infrequent in Iowa, and occurs in upland woods. The species is readily distinguished in the woods, but not so readily from the herbarium specimens. The color of the outer and inner bark is the safest guide. The pubescence in the axils of the veins beneath varies, and is to be found in *Quercus coccinea* Wang. The squaroseness of the scales intergrades.

The Quercitron has been confused with the scarlet oak to such a degree by Iowa botanists that it is extremely difficult to give any definite information regarding its range in Iowa. The reports of the species from eastern Iowa seem the more credible. We have looked upon the reports from western Iowa with considerable suspicion.

For many years the species has been recognized as occurring in Johnson county. Dr. White reported the species from Iowa, and was quoted by Professor Bessey. Professor Macbride reported the species from Dubuque and Humboldt counties; Messrs. Nagel and Haupt, from Scott county; Professor Pammel, from Hardin county; Professor Fink, from Fayette county; Mr. Gow, from Adair county; Mr. Rigg, from Calhoun county; and Messrs. Barnes, Reppert, and Miller, from Scott and Muscatine counties.

White, Geol. Sur. of Iowa, Vol. 1, p. 138; Bessey, Contr. to the Flora of Iowa, p. 119; Arthur, Contr. to the Flora of Iowa, p. 29; Nagel and Haupt, Proc. Davenport Acad. of Nat. Sciences, Vol. 1, p. 163; Fink, Proc. Iowa Acad. of Sciences, Vol. 4, p. 101; Gow, Proc. Iowa Acad. of Sciences, Vol. 6, p. 61; Cameron, Iowa Geol. Sur., Vol. 8, p. 198; Macbride, Iowa Geol. Sur., Vol. 7, p. 107; Vol. 9, p. 153; Vol. 10, p. 648; Pammel, Iowa Geol. Sur., Vol. 10, p. 313; Barnes, Reppert, and Miller, Proc. Davenport Acad. of Nat. Sciences, Vol. 8, p. 256; Rigg, Notes on the Flora of Calhoun county, p. 25.

Quercus ellipsoidalis E. J. Hill, Botanical Gazette, Vol. 27, p. 204, 1899. Tree twenty-five to sixty feet high, one to three feet in diameter, bark rather smooth, shallow-fissured, darkish colored near the ground, dull gray above, dull red within,

yellowish next the wood; leaves similar to *Quercus palustris* DuRoi; acorn solitary or in pairs, ellipsoidal, varying to somewhat cylindrical or globose, one-third to one-half immersed; cup turbinate or cup-shaped, thinnish, usually tapering into a peduncle; scales narrowly ovate, obtuse or truncate, brownish, pubescent, closely appressed.

This species is represented in Iowa by one tree growing near Big Rock, Scott county. Further search will probably find the species of frequent occurrence.

Hill, E. J., Bot. Gaz., Vol. 28, p. 215; Barnes, Reppert, and Miller, Proc. Davenport Acad. of Nat. Sciences, Vol. 8, p. 256.

†† Leaves 3-5-lobed toward the apex.

Quercus marylandica Muench, Hausv., 5:253, 1770. Black-Jack or Barren Oak. Our representatives of this species are usually small trees; leaves obovate, stellate-pubescent above, rusty-downy beneath when young, 3-5-lobed toward the apex, lobes entire or bristle-toothed, base rounded or subcordate; acorn ovoid, twice the length of the cup, surmounted by a conical dome; cup deep; scales oblong-lanceolate, appressed, pubescent. *Quercus nigra* B L., Sp., Pl. 995, 1753.

So far as our observations go this species occurs only in dry soil on the uplands. It is infrequent or even rare, occurring in Decatur and Appanoose counties, where our specimens were obtained. The probabilities are that the species occurs in Iowa only on the southern border. The species occurs in Nebraska, ranges southward to Texas and eastward to Ohio and New York, but does not occur northward. Specimens from Decatur county were sent to the Missouri Botanical Gardens for final determination.

Fitzpatrick, Proc. Iowa Acad. of Sciences, Vol. 6, p. 197.

Quercus nigra L., Sp., Pl. 995, 1753. Water Oak. With us this species is usually small; leaves spatulate, or sometimes entire and rounded, coriaceous, short-petioled, both sides green and glabrous, tufts of hair in the axils of the veins beneath; acorn globose, ovoid, with a slight but

broad dome, one-third or one-half immersed; cup saucer-shaped.

The character of the dome of the acorn readily distinguishes this species from *Quercus marylandica* Muench. Our specimens were obtained in one locality in Decatur county, which, so far as we know, is the only locality in the state. We published the species in Vol. 8, p. 314, Iowa Geological Survey as frequent. The publication was based upon genuine specimens, but at that time we had not learned to distinguish the species from *Quercus marylandica* Muench. We now believe that *Quercus nigra* L. is a rare species in Iowa. We have also published the species in Proceedings of the Iowa Academy of Sciences, Vol. 5, p. 164. All the trees we have observed occurred on dry uplands, and were associated with *Quercus marylandica* Muench.

Arthur, Contr. to the Flora of Iowa, p. 29; Fitzpatrick, Proc. Iowa Acad. of Sciences, Vol. 5, p. 164; Iowa Geol. Sur., Vol. 8, p. 314.

††† Leaves entire.

Quercus imbricaria Mx., Hist. Chen. Am., 9, Pl. 15, 16, 1801. Laurel Oak. Shingle Oak. Leaves lanceolate or oblong, entire, bristle-tipped, acute at both ends, short-petioled, glabrous above, persistently downy beneath; acorn subglobose; cup hemispheric, shallow, scales ovate-lanceolate, appressed.

In Iowa this species is found only in the southern half of the state and in that portion it is common, forming much of the upland woods. Trees rarely exceed one or two feet in diameter. The wood is light reddish brown and coarse-grained. The wood is utilized for fuel, coal props, and to a very limited extent for local lumber. Our specimens are from Johnson, Washington, Decatur, Ringgold, and Clarke counties. We have observed the species in Jefferson, Wapello, Appanoose, and Union counties. The State University has specimens from Henry, Des Moines, Van Buren, and Taylor counties. Mr. Reppert reports the species from Muscatine county.

White, Geol. Sur. Iowa, Vol. 1, p. 138; Bessey, Contr. to the Flora of Iowa, p. 119; Arthur, Contr. to the Flora of Iowa, p. 29; Pammel, Proc. Iowa Acad. of Sciences, Vol. 1, pt. 2, 1890-1891, p. 91; Fitzpatrick, Proc. Iowa Acad. of Sciences, Vol. 5, p. 164; Vol. 6, p. 196; Iowa Geol. Sur., Vol. 8, p. 314; Reppert, Iowa Geol. Sur., Vol. 9, p. 387; Macbride, Iowa Geol. Sur., Vol. 7, p. 108; Gray's Manual, Ed. 6, p. 478; Barnes, Reppert, and Miller, Proc. Davenport Acad. of Nat. Sciences, Vol. 8, p. 257; Sargent, Forest Trees of N. A., p. 154.

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